



data interchange for geotechnical and geoenvironmental specialists

The DIGGS Standard and Piling (v1)

Marc Hoit, Mark Styler, Mike McVay
University of Florida

**Geo-Engineering Data:
Representation and Standardisation
September 9th 2006**

University of Nottingham, Nottingham, United Kingdom
A workshop organised by JTC2 as part of the 10th IAEG Congress

Disclaimer: The examples and schema are preliminary and the final version will be available when the official version is released.

Need for Collaboration

- US is behind in standardization efforts
- UK through AGS has rich organization, experience and a well developed standard
- Collaboration can open markets
- International standard can improve practices and software
- New standards can improve products
- Future goal is asset management systems



Benefits of Data Standards

- Means for information sharing
 - single entry of data
 - reusable data
 - QA/QC – allows for software verification
 - More accurate bids (using existing data)
- Saves money, time and energy in system development
- Assists software makers in the development of programs that fit within the framework
- Allows for unified asset management and assessment

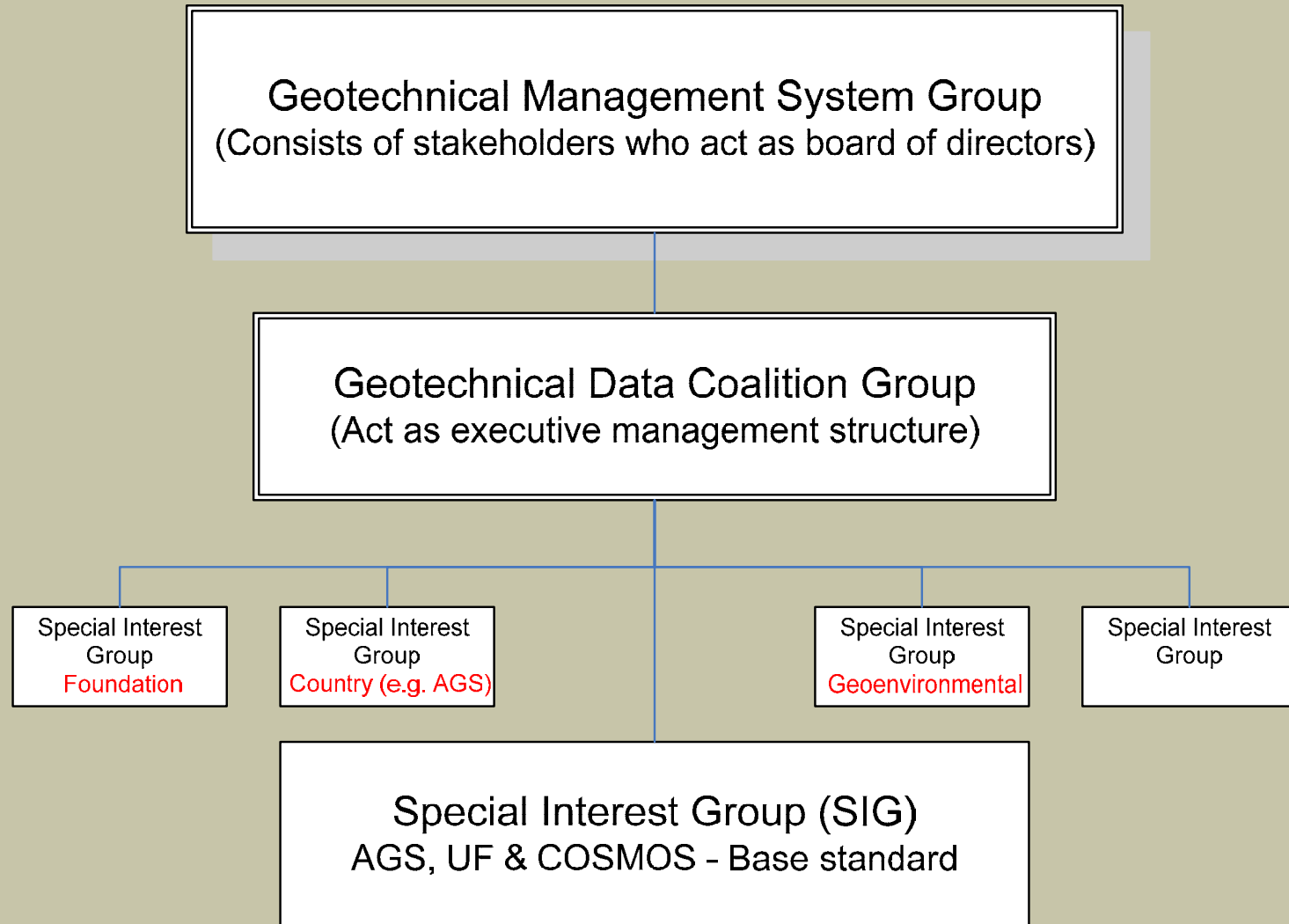


USA Pooled Fund Project TPF-5(111)

- \$643,000 in funding
- Combine existing geotechnical data standards (AGS, UF, COSMOS)
- Expand to include other data (i.e. geo-environmental, geohazards, slopes, drainage)
- Develop international organization to manage and enhance standard

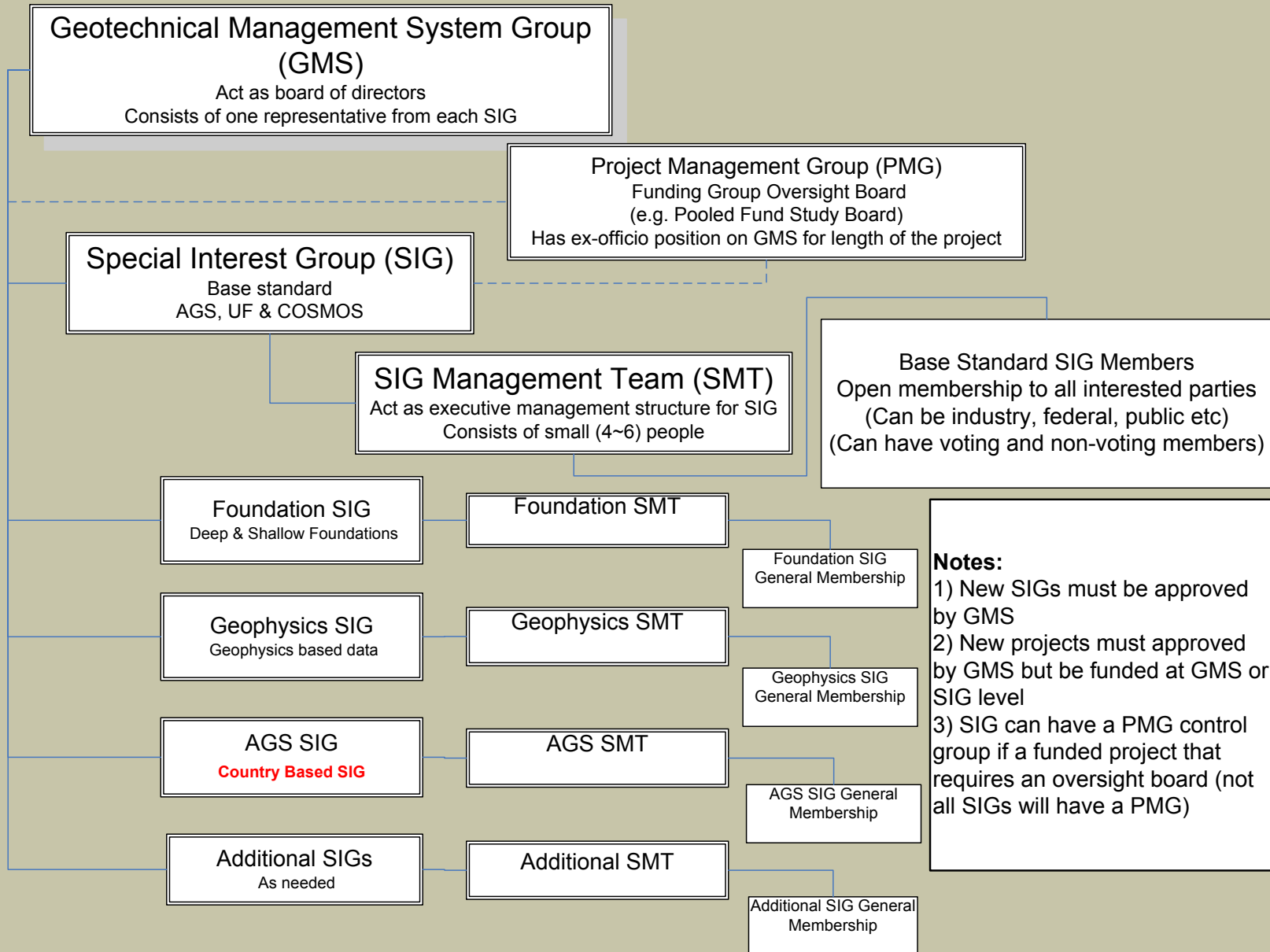


Pooled Fund Organization



Possible DIGGS Management Structure

(Under Discussion)



Project Timeline

- May 2005 – Pre-planning meeting
 - Agreement on skeleton structure and path forward
- August 2005 – Schema and Dictionary draft development
 - Base Draft developed
- November 2005 – Finalize Dictionary
 - Complete dictionary merger
- January 31, 2006 – Draft Dictionary and Schema
 - Distribute drafts for comment to management team
- May 15, 2006 – Internal Review of Draft
 - Perform an internal review of the proposed draft
- August 4, 2006 – Distribution of draft for limited review
 - Distribute for detailed review of dictionary, schema, guides
 - Comments returned by Sept 15
- November 1, 2006 – Distribution of full public review
- February 1, 2007 - Finalized version 1.0 of schema released



DIGGSML Benefits

- GML compliant
- Enumerated Lists (Codelists)
 - Defined values for elements (e.g. classification)
- Attached Files
 - Point to any type of file
- Units
 - POSC pre-defined (oil industry)
- Dictionaries
 - Authoritative definitions and schema on website
- Allows local extensions and profiles



Example Organization Based Profile

DIGGSML

HOLE | LAYER | DETAIL | LOG | FROST | CHALK

USGS.DIGGSML.ORG

USGS

HOLE | LAYER | DETAIL | LOG |

+

USGS

Geophysics
logging



Generic Draft Schema Structure

- **Transmission Information**
- **Project**
 - Location, date, etc
 - Excavation (future)
 - Face
 - Sample
 - Specimen
 - Layer
 - In-Situ Tests
 - Hole
 - Hole Parameters (dia, casing, etc)
 - Layer Information
 - Sample (type = core, etc.)
 - Specimen
 - Lab Tests
 - In-Situ Tests
 - SPT, CPT, Dilatometer
 - Monitoring Point
 - Monitoring Data
- **Surface Line (future)**
 - Line
- **Foundation**
 - Pile
 - Construction
 - Driving
 - Capacity
 - Section Information
 - Load Tests
 - Shaft
- **Geophysics**
 - Well Logging
- **Business Associate**
- **Equipment**
- **Dictionaries**

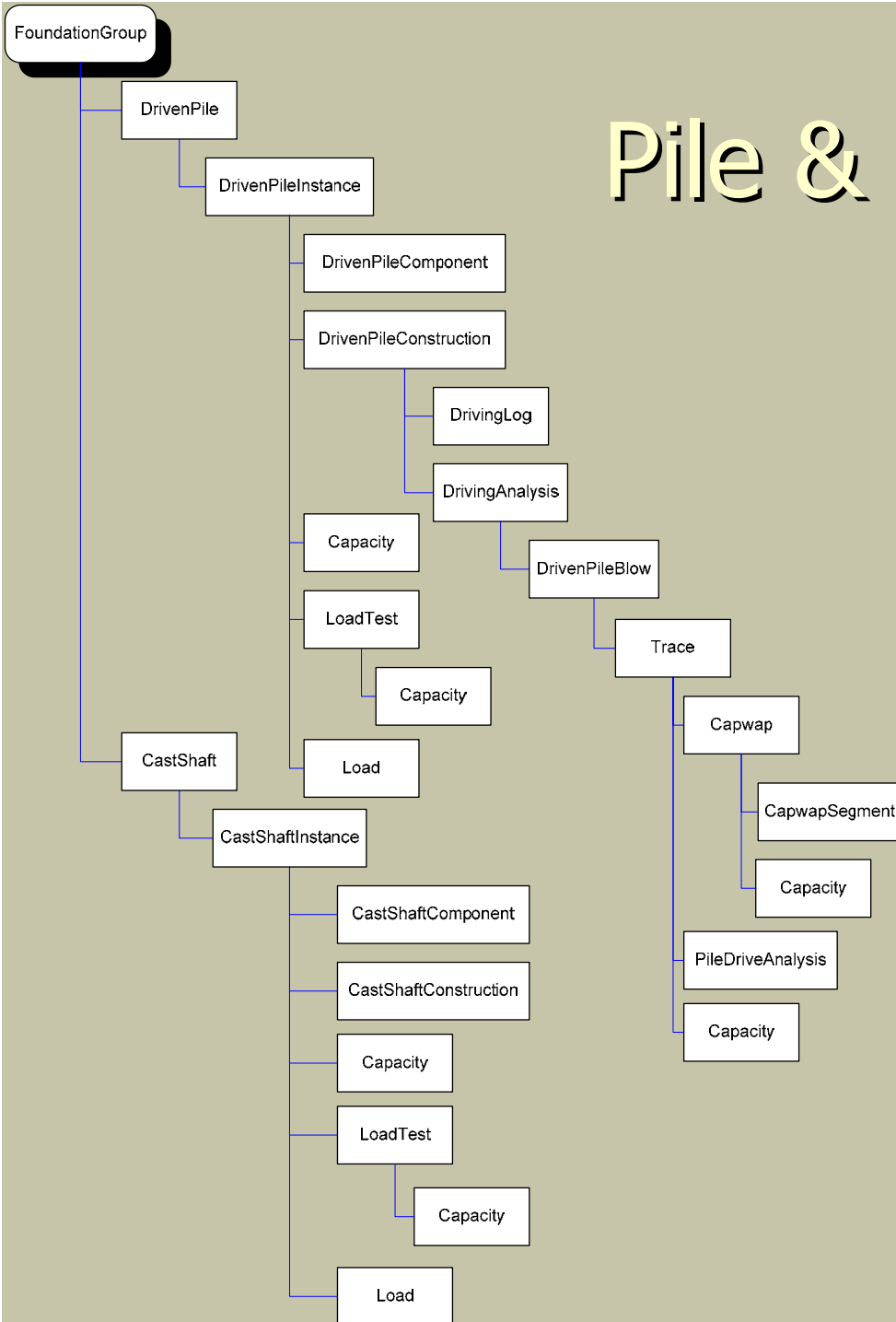


Piled Foundations

- Handles driven piles and cast shafts
- Multiple Instances of each
 - Design, constructed, tested, damaged, etc
- Contains cross section information
 - Shape, steel (pre-stressed and mild)
- Handles test data
 - Axial, lateral, dynamic, etc



Pile & Shaft Hierarchy



Pile Static Load Test Data

Microsoft Excel - DiggsFoundations.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

C11 fx -2.5

1	Load Test					
2	Project	Project Number	Bridge Name	Bridge Number	Pier Name	Pile Name
3	Sample Project	12345-6789	River Bridge	12345	Pier 7	Test Pile 1
4						
5	Test Type	Static LT				
6	Test Date	8/21/2006				
7	Depth Datum	Ground Surface				
8						
9	Load Test Data Table					
10	Elapsed Time	Applied Load	Displacement	Displacement		
11		-2.5	-2.5	63.5		
12	Depth					
13	Units	Seconds	kips	in	in	
14		0	0	0		
15		50	-0.0028	0		
16		100	0.0022	0		
17		150	0.0011	0		
18		200	0.0027	0.00013		
19		250	0.0116	0.00058		
20		300	0.0134	0.00067		
21		350	0.0237	0.00118		
22		400	0.036	0.00180		
23		450	0.0488	0.00243		
24		500	0.0602	0.00300		
25		550	0.0912	0.00455		
26		600	0.1399	0.00698		
27		650	0.2176	0.01085		
28		700	0.3345	0.01668		
29		750	0.5884	0.02934		
30		800	0.7186	0.03583		
31		850	0.733	0.03655		
32		900	0.7418	0.03699		
33		800	0.7562	0.03771		
34		700	0.7142	0.03561		
35		600	0.6852	0.03417		

The column names in the Load Test Data Table are recognized by the macro code. For example, if load test data for a 2 cell osterberg test would have 2 Applied Load columns, each with a depth corresponding to the location of the respective osterberg cell and units set to a pressure. Recognized column names: "Applied Load", "Displacement", "Load Transferred".

Help / File / Project / Foundation Group / Load Tests /

Ready Circular: E14 NUM

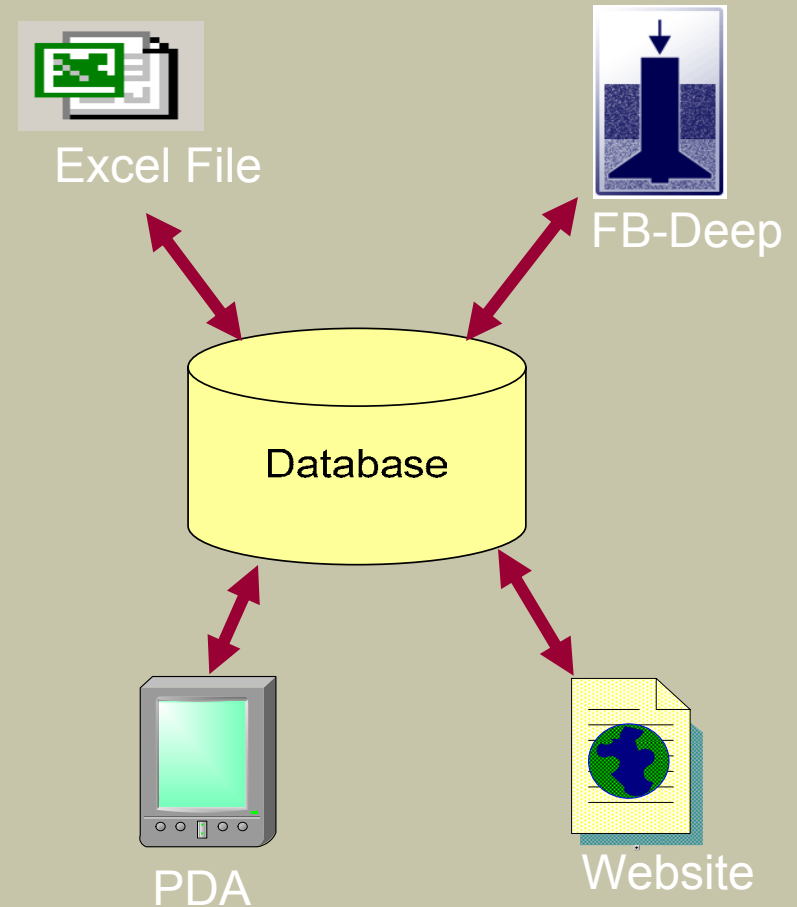
Data Types

- There exist 4 types of data
 1. Metadata about the test (date, time, location)
 2. Parameters derived from the test
 3. Raw from the test form which the parameters can be derived
 4. Calibration data
- The DIGGS transfer standard only includes 1) and 2) for most information



Florida Database Implementation

- FDOT funded the development of an XML based database
- Data restricted by user security
- Upload and retrieve through XML file
 - Web App controls conversion to DB format
 - DB format is not seen by users or applications
- Application centric – general access
- Browser access to view, update or retrieve in Excel
- Data controlled by designated users
 - Add users, create projects and data
- FDOT contract to implement DIGGS for 06-07



Extract or Submit any data fragment



Access Levels for User are identified
[View security section for more details](#)

XML Example Code:

```
...  
<Pile ID="32">  
  <Driving>  
    <Drv_Date>5/5/1987</Drv_Date>  
    <R_Energy>16.2</R_Energy>  
  </Driving>  
</Pile>  
...
```

- XML Tags are Parsed and the Data is entered into the appropriate tables as long as the User has the appropriate Access Levels to do so.
- Any fields the User Does not have Access for will NOT be updated.

Only data for which the user has security is available



Website with Namespace Documents

<http://DIGGSml.org>



data interchange for geotechnical and geoenvironmental specialists

[Home](#)

[Schemas](#)

[Publications](#)

[Applications](#)

[Contacts](#)

[Discussion Forum](#)

Quick Links

[Home](#)
[Schemas](#)
[Data Dictionaries](#)
[Publications](#)
[Applications](#)
[Meetings](#)
[Contacts](#)
[Special Interest Groups](#)

Approved Extensions

[Association of Geotechnical & Geoenvironmental Specialists \(UK\)](#)
[Florida Department of Transportation \(US\)](#)
[Virtual Data Center \(COSMOS\) \(US\)](#)

Draft Standard Review

[Login \(must have account\)](#)
[Submit comment](#)
[View Comments](#)
[Create Review Account](#)
[Edit Account Profile](#)

Welcome to DIGGS

Objectives of the Study

The objective of the study is to international standard geotechnical data interchange format consisting of a data dictionary XML schema which is GML compliant. The dictionary and schema will include a structure for geotechnical data, foundation data and geophysical data as well as a method for adding new features and guidelines for adding to the schema.

This standard will be submitted to the international bodies for acceptance.

[GMS Group](#)

The Geotechnical Management System Group (GMS group) composed of representatives from 12 State DOTs, FHWA, US EPA, US Army Corps of Engineers, and the US Geological Survey has been formed to govern the development of the standards for geotechnical data and to provide all final decisions.

[GDC Group](#)

Acting as an executive management team, oversight of development by the Special Interest Group (SIG) will be provided by the Geotechnical Data Coalition (GDC) with representation from UF, AGS, COSMOS, Construction Industry Research and Information Association (CIRIA), Federal Highway Administration (FHWA) and the Ohio Department of Transportation (ODOT).

[SIG \(Initial Schema and Data Dictionary\)](#)

The schema development and initial data dictionary will be a collaborative effort by a SIG consisting of the University of Florida, Department of Civil Engineering (UF), Association of Geotechnical and Geoenvironmental Specialists in the United Kingdom (AGS), Consortium of Organizations for Strong-Motion Observation Systems (COSMOS). The initial data dictionary will be based on the collection of dictionaries from these three groups consisting of Laboratory testing, Insitu-testing, Piling and basic geophysical data.



Conclusion

- DIGGS is an extensible standard
 - Organization and structure set up for inclusion of other standards
 - Allows for quick updates and customizations with a process for permanent inclusion
- International cooperation essential
- Base standard provides strong foundation for collaborative efforts

